MASTER
NEGATIVE
NO. 94-82041-9

COPYRIGHT STATEMENT

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials including foreign works under certain conditions. In addition, the United States extends protection to foreign works by means of various international conventions, bilateral agreements, and proclamations.

Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

The Columbia University Libraries reserve the right to refuse to accept a copying order if, in its judgement, fulfillment of the order would involve violation of the copyright law.

Author:

Metropolitan life insurance company, New York.

Title:

Budgeting manufacturing operations

Place:

New York

Date:

[1930?]

94-82041-9
MASTER NEGATIVE #

COLUMBIA UNIVERSITY LIBRARIES
PRESERVATION DIVISION

BIBLIOGRAPHIC MICROFORM TARGET

ORIGINAL MATERIAL AS FILMED - EXISTING BIBLIOGRAPHIC RECORD

BUSINESS
432.8
M5653

Metropolitan life insurance company, New York.
Policyholders service bureau.
Budgeting manufacturing operations. New York,
Metropolitan life insurance company [1930?]
38 p. forms. 27cm

RESTRICTIONS ON USE:

TECHNICAL MICROFORM DATA

FILM SIZE: 35mm REDUCTION RATIO: 15:1 IMAGE PLACEMENT: IA (IIA) IB IIB

DATE FILMED: 4-14-94 INITIALS: PB

TRACKING # : MSH 00360

FILMED BY PRESERVATION RESOURCES, BETHLEHEM, PA.

BIBLIOGRAPHIC IRREGULARITIES

MAIN ENTRY: Metropolitan life insurance company, New York.
Budgeting manufacturing operations

Bibliographic Irregularities in the Original Document:

List all volumes and pages affected; include name of institution if filming borrowed text.

_____Page(s) missing/not available:_____

_____Volume(s) missing/not available:_____

_X___Illegible and/or damaged page(s): water damage throughout_____

_____Page(s) or volume(s) misnumbered:_____

_____Bound out of sequence:_____

_____Page(s) or volume(s) filmed from copy borrowed from:_____

_____

_____Other:_____

_____

TRACKING#: MSH#00360

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
2.5 mm 1234567890

ABCDEFGHIJKLMNOPQRSTUVWXYZ
2.0 mm abcdefghijklmnopqrstuvwxyz1234567890

ABCDEFGHIJKLMNOPQRSTUVWXYZ
1.5 mm abcdefghijklmnopqrstuvwxyz1234567890

PM-MGP 13"x18"
METRIC GENERAL PURPOSE TARGET
PHOTOGRAPHIC

200 mm

150 mm

100 mm

A5

A4

A3

1.0

1.1

1.25

1.4

1.6

1.8

2.0

2.2

2.5

1.0 mm

1.5 mm

2.0 mm

2.5 mm

PRECISION℠ RESOLUTION TARGETS

Century

A&P

1303 Geneva Avenue
St. Paul, MN 55119

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
4.5 mm 1234567890

ABCDEFGHIJKLMNOPQRSTUVWXYZ
3.5 mm abcdefghijklmnopqrstuvwxyz1234567890

ABCDEFGHIJKLMNOPQRSTUVWXYZ
3.0 mm abcdefghijklmnopqrstuvwxyz1234567890

Metropolitan Life Insurance Co.
Budgeting manufacturing
operations.

D432.8 — M565b

D 432.8 M565 3

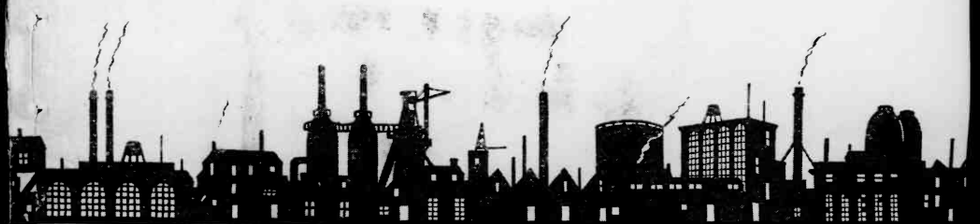
Columbia University
in the City of New York

LIBRARY

School of Business

LIBRARY
SCHOOL OF BUSINESS

BUDGETING MANUFACTURING OPERATIONS



POLICYHOLDERS SERVICE BUREAU
METROPOLITAN LIFE INSURANCE COMPANY
HOME OFFICE—NEW YORK
Pacific Coast Head Office—San Francisco
British Isles Head Office—London
Canadian Head Office—Ottawa

BUDGETING MANUFACTURING OPERATIONS

POLICYHOLDERS SERVICE BUREAU
METROPOLITAN LIFE INSURANCE COMPANY
HOME OFFICE—NEW YORK
Pacific Coast Head Office—San Francisco
British Isles Head Office—London
Canadian Head Office—Ottawa

COLUMBIA UNIVERSITY

AN ECONOMIC SERVICE TO BUSINESS

THIS is one of numerous publications issued by the Policyholders Service Bureau in the interest of better management in business. The Metropolitan has good reason for desiring to contribute, so far as practicable, to improved practices in management. Effective management is a vital factor in the continuous and profitable operation of business enterprises and helps to bring about steady work and regular income for Metropolitan policyholders, who number more than one out of five of the general population. A considerably greater proportion than one-fifth of the employees in commerce and industry are insured by the Metropolitan Life Insurance Company. The relationship between prosperous policyholders and the Company's progress is obvious.

Because of its great stake in the Nation's economic life, the Company has set up the Policyholders Service Bureau to carry out a program of economic service to business. The Bureau staff is made up of specialists in the various fields of management—in business organization, office management, accounting and finance; in marketing, distribution, advertising and sales management; in production and personnel management; in business and economic research; in industrial health and accident prevention.

Investigations of subjects of current interest to business executives are continually being carried on by the Bureau's specialists in these various fields of management. Reports of such of these investigations as are of general interest are published from time to time. For additional information about the work of the Bureau or its published reports, address:

POLICYHOLDERS SERVICE BUREAU
METROPOLITAN LIFE INSURANCE COMPANY
ONE MADISON AVENUE, NEW YORK CITY

Bus.
D 432.8
M5653

FOREWORD

A BUDGET SYSTEM has been defined as a systematic method of gathering information from the past and present, of formulating plans for the future on this basis and of reporting subsequently how these plans have been carried out. The application and use of this method of planning and recording give what is called "budgetary control."

Budgets are of many forms and uses. They are considered necessary by many executives since they make possible detailed consideration of the programs of all divisions in the enterprise. They become a check on theories and prejudices and furnish a clearly defined path from which all deviations can be recorded and explained. When properly designed, installed, and recorded, the budget will provide a chart that will assist in eliminating many of the hazards of an unknown future.

The extent to which budgetary control is employed depends upon the purpose to be accomplished and the necessities and abilities of the organization. It is used to correlate the manufacturing program to the sales estimate, to provide a schedule for the procurement of raw materials, to estimate all labor and expense items, to determine when capital expenditures will be profitable or necessary, to ascertain the financial requirements of the organization for a given period, and to enable the management to construct a plan of operation that will allow the greatest return on the capital invested.

This report has been prepared for the purpose of examining the methods by which industry is employing the budget as an instrument of control over its manufacturing operations. Although the manufacturing department is only one of the major divisions of any company, in most instances the cost of production represents a large percentage of the total cost of operation.

Continuity of manufacturing operations is fundamental to stability of employment for the working force. The planning incidental to budgeting places in the hands of management definite information for outlining the extent of manufacturing operations in advance—a powerful tool for leveling the peaks and valleys of the employment curve.

TABLE OF CONTENTS

PAGE

THE MASTER BUDGET 5
Sales Forecast 5
THE BUDGET PERIOD 6
PRODUCTION SCHEDULES 6
Production Schedules in Companies Manufacturing to Stock 6
Preparation and Control of a Manufacturing Program 7
Production at a Constant Rate 8
Special Order Production Scheduling 9
Manufacturing Standard Items to Customers' Orders 10
MATERIALS BUDGETS 11
Classification of Materials 11
Methods of Estimating Material Requirements 11
Control of the Materials Budget 13
THE LABOR BUDGET 13
Classification of Labor 13
Estimation of Labor Costs and Labor Requirements 14
THE MANUFACTURING EXPENSE BUDGET 15
Relation of Standard Costs to Budgeting 15
The Manufacturing Expense Budget and Standard Costs 16
Preparation of Manufacturing Expense Budgets 17
Budgeting Overhead in a Company Manufacturing to Customers' Specifications 21
Other Forms of Manufacturing Expense Budgets 22
METHODS OF CONTROL FOR PLANT AND EQUIPMENT EXPENDITURES 23
COMPARISON OF ACTUAL AND BUDGETED ACCOMPLISHMENT 24
Frequency of Review 24
Method of Comparison 24
Use of Graphic Charts for Comparison 28
Report of Budget Accomplishment 29
INCENTIVE SYSTEMS FOR SECURING BUDGET ACCOMPLISHMENT 31
Wage Incentives 31
Foremen's Bonus 32
Quality Bonus 32
Bonus for Control of Overhead Expense 33
INSTALLATION OF THE BUDGET 34
PRESENTATION OF THE BUDGET 35
THE BUDGET MANUAL 35
VALUE OF THE BUDGET 36

BUDGETING MANUFACTURING OPERATIONS

THE KEYNOTE of modern management is control. Budget systems designed to coordinate and control the various functions of the business enterprise have been developed in many organizations. Such systems are based on standards of achievement developed from a thorough knowledge of operating conditions. Effectiveness of control is measured by a comparison of actual results with budgeted performance.

A large part of the total cost of operating a manufacturing establishment is represented in the cost of manufacturing its products. This study outlines fundamental practices of industrial organizations in developing and administering the manufacturing budget, and cites illustrations of the degree of control that has been attained through its use. The information is based on existing practices of representative industrial organizations.

THE MASTER BUDGET

THE BUDGETING of manufacturing operations presents three principal problems:

1. Determination of the amount of each product to be fabricated during the budget period and the size of the most economical manufacturing lot.
2. Establishment of a production schedule to assure the prompt delivery of these products in accordance with the sales requirements.
3. Production of these goods at the lowest cost consistent with the required quality.

The very nature of these problems indicates that the cooperation of other departments is necessary for their solution. Correlation of the several departmental programs necessitates the setting up of a master budget, coordinating the controls over the major divisions and forming the general plan of operation for the budget period. The master budget usually includes the sales budget, the production budget, the financial budget, the capital expenditures budget, the advertising budget, the research budget, and all the other estimates and budgets required for the complete control of operations.

Sales Forecast

The major consideration in the preparation of a production program is the estimate of goods to be sold during the budget period. Four classes of information are usually considered in the preparation of this estimate:

1. Statistics of past sales.
2. General business and market conditions.
3. Conditions within the particular industry.
4. Plans and policies of the company.

With the sales estimate as a basis, the production program is set up allowing for actual and desired inventory, and with the seasonal fluctuations in the estimate adjusted to attain an even rate of production.

THE BUDGET PERIOD

The length of the budget period is usually the same as the normal business period of the industry in question. Some of the factors on which the selection of a budget period will depend are: availability of statistical records of past performance, availability of reliable indices for estimating future developments, the length of the accounting period, methods of financing, style influence, production methods, time necessary for the completion of a manufacturing cycle, and seasonal market features.

The majority of the companies whose experiences are included in this study use two periods for budgeting purposes—a long period, generally the fiscal year, and a short period ranging from one to three months. The annual budget period is of sufficient length to enable the management to prepare a general plan of operations that will include all seasonal variations, while the monthly or quarterly period is used for detailed control of immediate operations and permits periodic comparison of performance with standards, so that necessary adjustments for future operations can be made when deemed advisable.

Some companies have found it expedient to divide the annual budget period into thirteen periods of four weeks each. The major advantage of the four-week operating period over the monthly period lies in the fact that each period will be of equal length, permitting direct comparisons of performance without adjustments. For the same reason, other concerns divide the annual budget period into four thirteen-week periods and make the budget comparisons and revisions at the end of this period rather than quarterly.

To provide continuity in the preparation of plans and general policies, some firms prepare their budgets for a constant period in advance of actual operations.

The budget of the Atlantic Refining Company of Philadelphia, for example, is prepared every three months for the following twelve. The advantages of this procedure are outlined by H. G. Hill, Budget Director of this company, in the following paragraph:

> Maintaining the individuality of each three months' period in the forecast facilitates the work of estimating, as the more distant quarters can be reviewed and revised instead of being rebuilt. We are also convinced of the value of looking beyond the end of the calendar year, especially as the year end is approached.

PRODUCTION SCHEDULES

The preparation of a budget for the manufacturing department involves two factors:

1. The development of a production program in terms of units to be produced. (This is provided for in a production schedule.)
2. An estimate of the costs that will be incurred in the completion of this program. (This is provided for in budgets for labor, materials, manufacturing overhead, and plant and equipment.)

Manufacturing activities run to two extremes: from manufacturing standard items to stock, to manufacturing special orders to customers' specifications. Many plants operate as a combination of the two classifications. The procedure to be followed in scheduling and budgeting production will be partly dependent upon the classification within which a company's operations fall.

Production Schedules in Companies Manufacturing to Stock

Production schedules for companies manufacturing to stock usually are divided into two parts—the master schedule and the detailed schedule. The set-up of the master schedule generally consists of establishing a rate of production for each product and determining the inventories of finished goods necessary to meet the sales estimate. The detailed schedules are for the purpose of scheduling the work to individual machines and operating departments.

In preparing a master schedule there are four factors to be taken into consideration: the total estimated sales of all products for a given period, the total manufacturing capacity for producing these products in that period, the rate of demand for the products during the period, and the desired inventory at the end of the period. Unless the cost of carrying finished inventories is too heavy, either in interest charges or possible loss from obsolescence, it is the practice to schedule the manufacturing department at a constant rate of production, building up inventories during periods of subnormal sales. The amount of inventory to be accumulated during the slack seasons should be such that when the sales demand exceeds the production capacity, there will be a sufficient quantity of goods on hand to fill orders until the rate of sales drops to the production level.

Although master schedules are generally prepared for the fiscal year, it is customary to issue the detailed schedules for monthly or quarterly periods. This permits a greater flexibility of control, as the production schedules can be adjusted for any variations that occur between actual and estimated sales.

Before a production schedule can be issued, it is necessary to analyze the products to determine their component parts, the raw materials of which these parts are composed, and the various operations and departments in which these parts are fabricated. With the analysis complete, a system of raw material control is set up which will cover the procurement of material and its issue to the productive departments in accordance with the manufacturing program.

The actual preparation of the detailed production schedule begins with the routing and scheduling of every product and its component parts through the factory. Routing involves an analysis to determine the best method of producing the product, an analysis of the productive equipment and the available equipment capacity, the determination of the sequence of operations and the time that will be taken in the manufacture of the product and its parts, and scheduling the manufacture of parts into sub-assemblies and major assemblies so they will be started in process at such times as will insure their completion simultaneously.

The production schedule is then used in dispatching the work to the various operations in the order of its precedence or importance, controlling the work after the completion of one operation to the next, in accordance with the sequence determined, and recording the time of starting and completing each operation, so that the proper control may be exercised and lagging behind schedule prevented.

Several other important factors are involved in the control of production, such as the standardization of products and processes, the arrangement of equipment to provide for the least amount of travel from operation to operation, and the provision of special equipment that may be necessary.

Preparation and Control of a Manufacturing Program

The production scheduling procedure of the Walworth Company of Boston gives an illustration of a successful attempt to prepare and control a manufacturing program. Prior to the beginning of each new year, an estimate of expected sales for the entire company in terms of tons by product classes is figured on the basis of past performance and the general economic condition of the country. This tonnage is split among the four works and schedule of tonnages submitted to each one of the works managers. Before the beginning of each quarter, sales are reestimated for the succeeding six months. Desirable inventories at the end of the period are established and production schedules authorized. With these master schedules as a guide, each works manager prepares a definite production schedule for the coming month.

At the Boston works this schedule is converted into production totals for the various departments and the requisite man-hours are calculated. Then each department is allotted a definite budget of man-hours which are to

be converted into a given number of tons of product. In setting quotas, every attempt is made to have constant control over work-in-process so that the inventories of such work may be kept at the lowest possible level. The factors by which tonnages are figured in man-hours are the result of several years of careful research. A constant check on output against budgeted quotas has led to profitable economies.

The Boston works uses the following method in figuring help and production quotas and controlling the in-process inventory:

1. On the 15th of each month the planning department, with the approval of the Works Manager, issues a production schedule. This schedule gives only the tonnages by classes that it is desired to have go into finished stock. The schedule contains production figures in each class for the maximum production month, the capacity production year, the actual production, and percentage of schedule for the previous month and the schedule for the present month with the percentage of capacity required.

2. On the 16th of each month the accounting department furnishes the actual inventory figures of all work-in-process by classes, as of the first of the month. At the same time a report of the actual production by classes of each department is made up.

   Upon receipt of this information, it is possible to figure the estimated inventory as of the first of the succeeding month and by this means start only such tonnages in the primary departments as will, when processed, equal the standard work-in-process figures. This makes possible, (*a*) an approximately constant amount of work-in-process, (*b*) the securing of a cost which has not been affected by a fluctuating work-in-process.

3. Having received the schedule, it is first necessary to break it down and determine how much tonnage of each class of goods will go through each department. To do this, a chart has been set up giving factors to apply to finished stock tonnages. The tonnages in the foundries and forge shops are adjusted to give the desired work-in-process inventory referred to above.

4. With the tonnages of each class for each department thus determined, this figure is multiplied by the number of hours it takes each department to produce a ton of each class of goods. The number of hours per ton has been determined through experiment. A deduction is made to allow for expected progress once a year when these hours are revised. The figure stays intact for the ensuing year.

5. The number of hours having been determined, this figure is divided by the number of hours in the month that each department will work. This gives the number of men needed, not including absentees. A percentage allowance is added to take care of absentees.

6. By dividing the total tonnage to be produced by the number of working hours in the month, the production desired per working hour is secured. This is then multiplied by the number of hours in the day to get the daily tonnage quotas.

7. All of this information is sent to the executives on the Production and Help Quota Form. The daily quota is put on the Production Quota Form, one copy is given to the foreman and one is kept in the general superintendent's office.

8. Daily, the foremen report the tonnage produced and the total for the month to date on the Daily Tonnage Report. By this it is possible to tell daily just how production is progressing.

9. Daily, each foreman reports to the employment department the number of people working and absent. This information is correlated by the employment department and forwarded to the executives on the Daily Force Report.

10. Monthly, the accounting department makes up the Departmental Expense Analysis. This gives complete information as to the quotas and hours assigned and actually used, together with the expense per ton.

The foregoing method of arriving at help and production quotas and controlling the in-process inventory accomplishes the following objectives:

1. A forecast of the production to be turned out and the number of workers required.
2. A monthly check on actual results and a direct comparison with other months.
3. A check on each day's accomplishment, affording a means of maintaining scheduled performance.

Production at a Constant Rate

The successful planning of production at a constant rate is illustrated in the production control procedure of Eli Lilly and Company of Indianapolis. The production of the factory and the shipment of merchandise to the principal branch houses of this company are planned in order that the following objectives may be obtained:

1. Maintenance of an even rate of production per working day with due allowance for reduction in capacity during the summer vacation months.
2. Maintenance of an even rate of shipment from the factory per working day by varying shipments to branches in inverse proportion to the seasonal variations in the demands of other customers.
3. Maintenance of adequate stock at all times and at all distribution points to render proper service to customers.

Factory production is budgeted by setting production quotas, in units of product, for each of the manufacturing departments. These quotas are determined in the following manner: The sales for any twelve-month period are estimated to be the sales for the twelve-month period just closed, plus or minus the trend as indicated by a comparison of the twelve-month period just closed with the twelve-month period that closed one month previously. The production during the balance of the year must be the number of units which, when added to the present stock, will permit sales equal to the estimate and leave a carefully determined stock on hand at the end of the year. The number of units to be produced during the current month will bear the same relation to the total production required for the balance of the year as the number of working days in the current month bears to the number of working days in the balance of the year. The final quota is the figure so determined plus a percentage adjustment during non-vacation months and minus a percentage adjustment during vacation months. The planning department supervision attains these production quotas with practically no deviation.

Special Order Production Scheduling

Production scheduling for those companies whose products are manufactured to customers' specifications is generally confined to the preparation and issue of detailed schedules and dispatching the work after actual sales orders have been received. The procedure followed in the preparation of the schedules and the routing of orders is very similar to that employed by companies manufacturing to stock.

The Sivyer Steel Casting Company of Milwaukee has been able to deliver an unusually high percentage of orders on the dates scheduled by keeping a close control of orders and materials-in-process. This company maintains a jobbing foundry, and control is obtained by issuance of forms and records at strategic points which are supplemented by organized personal attention of the production department or supervisory force.

New orders are entered on an order recapitulation form in duplicate, one section being a recapitulation of the information given in the order, the other section being used for entering information relative to cores needed. Upon receipt of an order, careful check is made of previous orders for the same patterns. Quotations are checked, questions of analyses are settled, and delivery promises entered for shop information.

From the order recapitulation, a work order consisting of four copies is issued for each pattern. One copy is sent to the shipping department, one to the pricing department and two to the pattern storage. The form sent to the shipping department provides space for dates, pieces made, pieces shipped, defectives and delivery dates scheduled. The shop cards provide space for specific instructions needed to put the job in process and to show a record of work performed.

A core order is made from the core recapitulation copy of the order recapitulation form. This is sent to the core department with the core boxes at least two days before the molders get their work orders. This time allowance for the core department is considered ample for the preparation of the cores.

Shop orders, upon leaving the office, are sent directly to the pattern storage and all pattern equipment required is laid out on a bench for inspection. The pattern equipment which is to be used is studied carefully

and examined by the shop executives. Accompanying each old pattern are records of any difficulties reported on previous orders, either by the customer or the foundry. Unusual loss through defectives is also given consideration at this time.

Each morning all approved orders received at the pattern storage on the previous day are given to the schedule clerk. The foreman of each molding department is called in and the jobs discussed and molders assigned. Dates on which shop work will begin are set according to work ahead. Then the work orders are filed on a schedule board in accordance with the dates which have been designated. The molding foreman is held responsible for fulfilment of molding schedules according to orders assigned to individual units, and he makes the necessary arrangements for delivery of complete equipment to the molders. A day-by-day record of schedule efficiency is kept.

After a job is definitely scheduled, one copy of the work order is sent to the office. From the date recorded thereon a shipping date is determined and the customer is notified when shipment will be made. This copy of the order is the production department's delivery control record. Both molding and shipping dates are recorded on it and it is used daily in checking progress of orders so as to insure movement in process and shipment as promised.

Each day a production meeting is held at which molding and shipping of scheduled orders are discussed and current and overdue promises, both of the molding and finishing departments, are given particular consideration. The primary purpose of this meeting is to discover the causes for delay and rectify them before they have been in effect long enough to check production seriously and result in dissatisfaction through failure to keep delivery promises.

Manufacturing Standard Items to Customers' Orders

Between the extremes of manufacturing standard items to stock and the production of special orders lies the manufacturing of standard items to customers' orders. This procedure is usually followed when the products represent a large investment of capital and when the sales of each item during a year are numerically few. This situation is generally found in plants manufacturing large heavy duty machinery.

An example of an effective production control system in this field of manufacture can be illustrated in the procedure employed by the Chambersburg Engineering Company, Chambersburg, Pennsylvania. Shop orders are initiated by the order department upon receipt of a sales order. Four copies of the shop order are issued, one each for the design department, the planning department, the stores department, and the accounting department.

The design department issues a parts list, or bill of materials, together with the drawings, drawing list and specifications covering that order, these being sent to the planning department. A copy of the parts list is also forwarded to the accounting department.

Upon receipt of the shop order, the planning department consults its file of standard operation cards. These are, in effect, combination route and schedule cards for each separate component of each machine made by the company. The data on each card are arranged according to sequence of operations and include the overhead expense symbol for each machine.

From these operation cards, the planning department is able to reduce the work represented by the order to time, and thus prepare a schedule. Starting with the delivery promise and working backwards, dates are assigned for the production of each part of the machine on order. With this are specified the dates that raw material and finished parts must be on hand for the work in the shops and in the erecting department. With the latter schedule in front of him, the purchasing agent arranges for the delivery of materials.

The above production planning is done on a control board consisting of a continuous sheet resembling a Gantt chart, mounted on

rollers. The chart is carried on a frame, at the left of which is listed vertically all the machine tool and other production equipment in the plant, singly or in groups. Horizontal lines represent time. Light horizontal lines indicate the number of hours required to perform the given operation assigned to each unit of equipment. Progress of the work is checked daily, and the availability of machine tools and other equipment for subsequent orders is readily predicted.

In the meantime the planning department has prepared work tickets covering each operation on each part to be produced. These tickets are made out in triplicate, the original copy being the operator's instructions to work on the given part, the second is forwarded to the accounting department, and the third is retained in the planning department to indicate the issued tickets. The reverse side of the original is ruled so that the operator may record the time spent on the operation covered by the work ticket.

With these tickets the accounting department has a complete cost history of every sales order, including direct material, direct labor and burden. It will thus be seen that the records forming part of the routine production control serve both cost department analysis purposes and production control. Costs of each machine in process are compared carefully with historical costs of the same or similar work.

When the work on all parts of a machine built to a given order has been completed, the work tickets are collected and filed together, forming a permanent record of the building of that machine.

MATERIALS BUDGETS

While the control of raw material is essentially a part of the production planning procedure, it is customary to develop a materials budget as a method of controlling the purchases of raw material. This materials budget is based on information taken from the production schedule and consists of two parts, (1) the estimate of raw material requirements necessary for the manufacture of the goods outlined on the production schedules and, (2) a schedule of purchases, in terms of quantities and time, so that the raw materials will be on hand and ready for use in the manufacturing department when called for. The quantities listed on the estimate of raw materials and those on the schedule of purchases may vary, in order that the purchasing department can procure the materials in even lots and at best market prices.

Classification of Materials

Although the majority of plants use two classifications for materials, direct and indirect, additional classifications have been found necessary in some instances. One company, manufacturing writing fluids, has found it advisable to use three classifications—raw materials, indirect materials and supplies. Raw materials include those basic ingredients used in the manufacture of the fluid, indirect materials comprise materials actually used in the "put up" of the product but too small to be handled on a requisition basis, and supplies are composed of those materials which are bought to facilitate the manufacture of the product but which do not actually enter into it.

This classification of materials is also used by a company manufacturing heating equipment. Indirect material is considered as overhead for accounting purposes, but is included with the direct material requirements in the materials budget. Miscellaneous supplies, however, are not included in the materials budget but appear as an item of manufacturing expense.

Methods of Estimating Material Requirements

The methods employed in estimating raw material requirements are dependent to some extent on the degree of standardization to which the products of the company have

BALANCE OF STORES

DESCRIPTION

UNIT

ORDER QUANTITY
MINIMUM
LOCATION

ORDERED				RECEIVED				REQUISITIONED					ISSUED			
DATE	PURCHASE ORDER	AMOUNT	ACCUMULATIVE TOT.	DATE	PURCHASE ORDER	AMOUNT	ACCUMULATIVE TOT.	DATE	FACTORY ORDER	AMOUNT	ACCUMULATIVE TOT.	BALANCE AVAILABLE	DATE	FACTORY ORDER	AMOUNT	ACCUMULATIVE TOT.	BALANCE ON HAND

FIGURE I—*Typical Balance-of-Stores Record*

been subjected. For example, some organizations have been able to analyze their products to such a degree that the exact raw material requirements for each unit produced have been definitely established. In such cases, it is customary to have a standard material requirements list for each product showing the amount of raw materials used in the production of the product and its component parts. When the production schedule has been established, the amount of material necessary for the fulfilment of this program can be determined from the material requirements records.

Such procedure is followed by a company fabricating motor accessories. The planning department of this company has established a control system covering purchases of all raw materials and finished parts used in the assembly of their products. All parts have a standard specification developed by the standards or engineering department. Inventory reduction and control are accomplished by purchasing on a set maximum and minimum basis. Parts for standard units are stocked on a maximum and minimum monthly requirement based on previous experience. Small standard parts such as rivets, lock washers, nuts and bolts are purchased in larger quantities in order to take advantage of the best price. Special parts required for specific orders are purchased in a quantity sufficient to cover the customer's order plus some small amount for shrinkage.

In many industries the raw material content of products changes from year to year. In such instances, the development of standard requirements records may involve too much detail to be practical. Some companies, especially those using only one or two basic raw materials, have been able to set up ratios between the volume of sales and the basic raw material requirements, and have prepared their materials budget on this basis. Foundries and steel mills have found this simple procedure very effective in controlling material purchases.

The Taylor-Wharton Iron and Steel Company of High Bridge, New Jersey, budget their one large item of direct material on the basis of the anticipated production for each month. They have developed a ratio between the production, in tons of good steel castings, and the total number of tons of pig iron, scrap, etc., that will be necessary for this production. For example, if the estimated production called for was 840 tons of castings, the materials budget would call for 1,200 tons of raw material.

The schedule of material purchases can

be controlled effectively by the use of balance-of-stores records. (Figure 1 illustrates a typical balance-of-stores record.) This procedure involves the use of an inventory record of each item of raw material used, showing at any time the balance at hand, amounts received and issued, amounts reserved for production orders issued but not called for, the reorder point, and the quantity to order. The reorder point and the quantity to order will depend upon the interval of time between the issue of a purchase order and the date that the material will be in the plant ready to use, the rate of consumption of raw materials, as shown in the production schedule, and the desirable reserve that should be on hand to take care of delays in delivery of raw materials.

The purchase of raw materials should not, however, be an entirely automatic procedure. The reorder point and the quantity-to-order amount should be frequently examined so that changes in the production or raw material requirements, as made by the planning or engineering departments, will not be overlooked by the purchasing department.

Indirect materials (those materials and supplies which do not form a part of the finished product) are generally included in the manufacturing expense budget, due to the fact that the amounts of these materials used do not necessarily vary directly with the volume of production. Generally, it is considered advisable, however, to control the purchases of these materials in a manner similar to that used for control of raw materials.

Control of the Materials Budget

The materials budget generally consists of two parts, the estimate of raw material requirements and a schedule of purchases. The control of the first part is a function of the planning division of the manufacturing department. The control of the second is a function of the purchasing department. If this department comes under the jurisdiction of the production executive, the materials budget is considered a part of the production budget and the responsibility for its administration belongs to the production executive. If, on the other hand, the purchasing department is independent of the manufacturing department, the schedule of purchases becomes a separate unit in the master budget, and the responsibility for its administration lies with the purchasing executive. In either case, however, it is considered advisable to secure the approval of the production executive before this estimate is formally adopted.

THE LABOR BUDGET

Classification of Labor

There are two classifications of labor used in manufacturing establishments—direct and indirect. Direct labor is that effort which is used directly in the manufacture of the finished product, and indirect labor is that effort which is used to facilitate the manufacture of the product. Although for cost accounting purposes indirect labor is generally included as a manufacturing expense item, many companies have found it advisable to include indirect labor in the labor budget. This practice is followed by the company manufacturing heating equipment, referred to in the section on "Materials Budgets." Their practice is to segregate indirect labor as an overhead expense on the company's records, but for budget purposes it is included with direct labor.

To provide the most adequate control, direct labor budgets are prepared in terms of cost for the payroll and financial departments and in terms of men, man-hours or machine-hours for the use of the production department. Indirect labor usually is budgeted simply in terms of cost and men, with the exception of some maintenance departments in which it has been possible to make a further analysis in terms of man-hours.

Estimation of Labor Costs and Labor Requirements

The method to be employed in estimating labor costs is dependent upon cost accounting practices of a company and the methods of wage payment in use. Companies having incentive systems for all direct labor operations use the incentive rates for the calculation of labor costs and the determination of the number of man- or machine-hours necessary for the fulfilment of the production program. This calculation consists of multiplying the standard time allowance and rate for each operation by the number of times that the operation is to be performed during the budget period. The classes of labor necessary for the completion of the manufacturing program can be determined also by the use of the incentive data.

Many companies have found it impracticable to put all the direct labor operations on an incentive basis, day or hourly rates being considered expedient or necessary on a portion of the work. The preparation of labor estimates under these conditions is generally undertaken by the foremen or factory managers. These executives are given a schedule of the work to be performed in their departments and, based on past operating information, they estimate the amount of each class of labor that will be necessary for the completion of the production program.

It is advisable to furnish either the personnel department or the works manager with a copy of the estimates of labor requirements, so that the necessary amounts of all classes of labor will be available when needed. When the schedule does not call for a constant rate of production, the personnel department is able to plan so that employees may be shifted from department to department according to their needs and the qualifications of the employees. This flexibility of labor aids in reducing labor turnover and the cost incident to the training of new employees.

This practice is followed by a Pacific Coast public utility company in budgeting their labor requirements. The system operated by this company requires each supervisor to plan for twelve months in advance how many men he will require for each month of the following twelve. This planning is done monthly and previous estimates are changed when necessary. The estimates call for a number of men by occupation—not merely a lump number—and are submitted to the head of the department which takes care of all of the operating employees. These estimates are tabulated by divisions and by the department as a whole. This allows the operation of an exchange of employees to all divisions through this office. The tabulated figures show when one division will have a surplus or when it will need help of a definite kind. By comparison it is possible to avoid, to some extent, peaks and depressions in the number of employees by shifting them from one division to another. It also shows the supervisors just how evenly they are spreading out their work over a year, as each supervisor makes up a labor budget from his plan of operation.

Planning the labor budget in terms of cost is necessary for two reasons: determination of the necessary cash requirements to provide for payroll disbursements, usually one of the largest items of manufacturing cost, and predetermination of manufacturing costs and the consequent estimates of profit or loss. The breakdown of labor requirements in terms of cash may be made by either the payroll or personnel department, but it should be done prior to the start of the budget period.

Although indirect labor is generally considered as an item of overhead expense for accounting purposes, it is well to include estimates for this type of labor in the labor budget. The heads of the various service departments and those production departments having clerks, truckers, inspectors, etc., assigned to them can prepare an estimate of the amounts and classes of labor necessary for the completion of the production schedule. These estimates are based on the experience gained from past operations modified with any estimates of salary increases that will be made during the period. Schedules of indirect labor expense should be furnished the

payroll and personnel departments, together with those for direct labor.

The preparation of labor budgets, in companies manufacturing to customers' orders, is illustrated in the procedure followed by the Newport News Shipbuilding and Dry Dock Company. The labor budgets of this company are prepared and issued as soon as practicable after an order for the construction or repair of a vessel is received, and are based upon the best information available. The purpose of this budget is to allow the preparation of labor requirements and piecework contracts. The budgets are based on the estimated labor which goes to make up the contract price.

Labor budgets are revised by this company for the following causes: addition or omission of work resulting from changes under the contract, changes in yard organization, changes in the routine of work from one department to another, and improvement in facilities. Budgets may be adjusted between departments on the written recommendation of a superintendent, giving his reasons therefor, provided the total is not affected.

THE MANUFACTURING EXPENSE BUDGET

The manufacturing expense budget, as well as providing the financial department with an estimate of the expenses incident to the operation of a factory, provides an effective method of controlling departmental expenses. Companies whose products are manufactured to customers' specifications, and which do not operate an all-inclusive budget, have found that the manufacturing expense budget offers a satisfactory method of controlling operating expenses. In organizations of this type it is difficult, if not impracticable, to forecast sales and prepare estimates of labor and material requirements. Manufacturing expenses, however, can be determined with a fair degree of accuracy from a study of past operation records, and budgets based on these figures will provide a cost control for this important factor in plant operations.

Many organizations manufacturing to stock find it difficult to make sales estimates and to budget labor and material, due to the influence of rapid style changes. Here again, the manufacturing expense budget affords a method for controlling departmental expenses incurred in the manufacturing processes. The manufacturing expense budget has been used effectively by several companies as the starting point for the installation of a complete system of budgetary control.

There are two methods in general use for the preparation of manufacturing expense budgets. One is through the use of predetermined or standard burden rates, and the other by the preparation of estimates of actual expense, by accounts, to be incurred in the budget period.

Relation of Standard Costs to Budgeting

It will be well at this point to discuss briefly the relation of standard costs to budget making. Both procedures are concerned with making estimates of costs and establishing the allowances of money, labor, and material that will be necessary for the completion of a given program. Allowances under a system of standard costs usually are expressed in terms of dollars per unit of product or per operation, while budget standards are the overall departmental allowances for a given volume of production.

It is evident that standard costs can be used advantageously in the preparation of a budget. The standard cost of a product is that cost which is based on definite specifications with a fixed allowance, expressed in terms of dollars, for labor, material and overhead, these allowances being determined from average or normal operating conditions.

The standards for material are determined from an analysis of all the raw materials entering into the product. The material cost allowance is a predetermined fixed price based on market conditions. Temporary

market changes do not affect material standards, as raw material inventories are held at cost and any plus or minus variation from the standard material cost is absorbed in a material variation account.

The preparation of a materials budget, where standard costs are in use, becomes a relatively simple matter. With the volume of production determined from the production schedule, the total amount of each product to be fabricated is multiplied by its material standard and the amount of material and its allowable cost is determined. The material standards should be examined at this time to make sure that there has been no definite change in market conditions; if there has been a definite change, the standards should be revised accordingly. If a definite change in material prices occurs during the budget period, the standards should be revised at that time and a revision made in the materials budget to allow for this price change.

The standard allowance for direct labor cost is the piece rate per unit of product based on scientific job analyses made for each labor operation. Variations in labor cost, due to the use of hourly rates, or task and bonus systems, can be handled through a labor variation account. Variations due to overtime excess or to the training of new employees are handled through separate accounts for this purpose. The overtime excess account and the breaking-in-labor account can be used effectively in measuring the efficiency of the operating department.

The preparation of a direct labor budget where standard costs are used is similar to the preparation of the materials budget. The labor budget standard is the result of multiplying the labor standard allowances for each product by the number of units to be manufactured during the budget period. However, as in the case of the standard materials cost and the materials budget, if basic wage rates are changed to meet the requirements of the labor market, the standard labor costs should be changed and a revision of the labor budget made. Changes in processes and methods of manufacture will also affect the labor cost and may necessitate revision of labor standards and the labor budget.

The Manufacturing Expense Budget and Standard Costs

The preparation of the manufacturing expense budget, based on standard costs of manufacturing expense, is not so simple an operation as the preparation of the labor and material budgets. Overhead, unlike direct material and labor, does not vary directly with the volume of production. Therefore, when standard burden rates are used in the preparation of an expense budget, these rates being based on a normal or average volume of production and for a normal operating period, the resulting budget will set standards of accomplishment for a normal period. If the budget forecast shows an abnormal condition, the standards set by the expense budget will more than absorb the actual cost incurred. If, however, the budget forecast predicts a subnormal condition, the standards will not absorb the actual manufacturing expense incurred. In other words, for control purposes, it seems more logical to prepare the manufacturing expense budget in terms of the conditions to be expected during the period under consideration, rather than normal conditions.

Many companies, however, have established burden rates in such a manner that they may be adjusted to various production volume levels, thus permitting the preparation of a manufacturing expense budget which will set adequate standards for the period in question. Some of the methods used for adjusting burden rates to the production volume level are as follows: rate of variability, whereby coefficients or percentage adjustments are set up for different volumes; estimates of overhead expense for the budget period in question translated into standard burden rates for that period; or charts on which curves are plotted showing the relation between the various expense accounts and the volume of production.

While standard costs are used extensively

in the preparation of labor and material budgets, the majority of the companies included in this study use departmental estimates of expense in the preparation of the manufacturing expense budget. Many of the companies also translate these departmental estimates into standard burden rates for the budget period.

Preparation of Manufacturing Expense Budgets

Manufacturing expense budgets are usually prepared in two forms, one for each of the productive departments and one for general plant expense. Many companies prepare additional expense budgets for the service departments, incorporating in the general plant expense budget only those items that cannot be directly allocated to any department. The following paragraphs illustrate the manufacturing expense budgets of C. G. Conn, Ltd., of Elkhart, Indiana, and the methods employed in their preparation.

The manufacturing departments are analyzed as to the amount of expense incurred during the past year. The expense groups of the company are as follows:

Supervision
Inspection
General Labor
Overtime Excess
Reclamation Labor
Tool Repair Labor
Machine Repair Labor
Equipment Labor
Spoilage Labor
Supplies
Reclamation Material
Tool Repair Material
Machine Repair Material
Equipment Repair Material
Spoiled Material

From the analysis of these accounts an average expense per accounting period is computed and placed on a form (Figure 2, page 18) called an expense schedule. The expense schedule is sent out to the foremen who place on it their best estimate of the cost necessary for the operations of their department for the next period. This expense schedule is returned to the cost department and reviewed item for item by the factory manager, the superintendent, the cost accountant and the foreman of the department in question. In a conference of these four executives, all contemplated changes during the next budget period are considered and a standard expense schedule is set up which is to stand intact for the budget period. These schedules are then written on a form (Figure 3, page 19) prepared for this purpose. Five copies are made, one for each of the following: foreman, superintendent, factory manager, general manager of manufacturing, and cost accountant.

The general factory expenses of this company are prepared in a similar manner and on a standard expense schedule. The accounts and their sources of information are shown in Figure 4 (page 20).

These various manufacturing expenses and the general factory expense items constitute the total manufacturing expense.

The cost analysis division of the cost department of this company has built up a standard cost for each item of product. This standard is based on the piece-work rates and the material used. The standards are being revised constantly to meet changing methods and rates in use in the manufacturing department. This gives at all times the latest standard cost of products manufactured.

The standard burden rate used by this company is calculated in the following manner. The productive labor estimated for the year is totaled. The estimated manufacturing expense for each department is added to the general factory expense for the year, resulting in an estimate of total factory overhead for the year. This total, divided by the total productive labor for the year, gives the amount of overhead per dollar of productive labor. The percentage thus determined is the burden rate for the year and is used in preparing the standard costs.

A record of the products transferred from the manufacturing division to the finished stock room is kept, divided into the cost of labor, material, and overhead. From this record, the percentage of material and labor to the total cost is determined for each budget group of product. An excellent control over departmental expense is assured through the schedules and the conferences incident to their analysis.

STANDARD EXPENSE SCHEDULE

Acct. No.	Description — Average Actual Last Year	Number	Hours	Rate	Standard Amount per Period	Standard Amount per Week
	PRODUCTIVE LABOR					
1	Supervision					
2	Inspection					
3	General Labor					
4	Overtime					
5	Reclamation Labor					
7	Tool Repair Labor					
8	Machine Repair Labor					
9	Equipment Repair Labor					
10	Spoilage Labor					
	TOTAL LABOR					
51	Supplies					
55	Reclamation Material					
57	Tool Repair Material					
58	Machine Repair Material					
59	Equipment Repair Material					
60	Spoilt Material					
	TOTAL MATERIAL					
	GRAND TOTAL					
	Fixed					
	Fluctuating					
	GRAND TOTAL					

FIGURE 2—*Schedule for Estimating Departmental Expense*

STANDARD EXPENSE SCHEDULE

PERIOD — TOTAL MFG. COST

Account Number	Description	Hours in Standard Month	Rate — Amount per Hour	Standard Amount — per Period	Standard Amount — per Week
	PRODUCTIVE LABOR				
1	Supervision				
2	Inspection				
3	General Labor				
4	Overtime				
5	Reclamation Labor				
7	Tool Repair Labor				
8	Machine Repair Labor				
9	Equipment Repair Labor				
10	Spoilage Labor				
	TOTAL LABOR				
51	Supplies				
55	Reclamation Material				
57	Tool Repair Material				
58	Machine Repair Material				
59	Equipment Repair Material				
60	Spoilt Material				
	TOTAL MATERIAL				
	GRAND TOTAL				
	Fixed				
	Fluctuating				
	GRAND TOTAL				

FIGURE 3—*Standard Expense Schedule and Departmental Budget*

ACCOUNT NAME	SOURCE OF INFORMATION
Supervision	General Manager of Manufacturing
Inspection	General Manager of Manufacturing
Spoilage	Cost Department Records
Payroll Department Salaries	Cost Department Records
Employment Department Salaries	Cost Department Records
Factory Office	Production Manager
Shop Clerks	Cost Department Records
Freight Hauling	Cost Department Records
Stockkeeping	Chief Stockkeeper
Inventory Expense	Cost Department Records
Free Repairs—Labor	Cost Department Records
Repairs to Returns—Labor	Cost Department Records
Suggestion Committee	Cost Department Records
Cost Department Salaries	Cost Department Records
New Tools—Labor	Chief Engineer
Factory Stationery	Production Manager and Cost Department
Scrap Material	Cost Department Records
Free Repairs—Material	Cost Department Records
Repairs to Returns—Material	Cost Department Records
Taxes—Inventory	Cost Department Records
Miscellaneous Manufacturing Expense	Cost Dept. Records and General Manager of Mfg.
New Tools—Material	Chief Engineer
Factory Traveling Expense	General Manager of Manufacturing
Reclamation—Labor	Cost Department Records and Superintendent
Testing of Finished Product	Cost Department Records
Supplies	Cost Department Records
Reclamation—Material	Cost Department Records
Building Repairs—Labor	Cost Department Records and Maintenance Eng'r
Sweepers and Watchmen	Cost Department Records and Maintenance Eng'r
Firemen	Cost Department Records and Maintenance Eng'r
Building Equipment Repairs—Labor	Cost Department Records and Maintenance Eng'r
Taxes— Real Estate	Cost Department Records
Coal	Cost Department Records
Building Operation Supplies	Cost Department Records
Building Repairs—Material	Cost Department Records and Maintenance Eng'r
Depreciation	Cost Department Records
Building Equipment Repairs—Material	Cost Department Records and Maintenance Eng'r
Machine Repair—Labor	Cost Department Records and Maintenance Eng'r
Equipment Repair—Labor	Cost Department Records and Maintenance Eng'r
Truck Supplies	Cost Department Records
Machine Repairs—Material	Cost Department Records and Maintenance Eng'r
Equipment Repairs—Material	Cost Department Records and Maintenance Eng'r
Taxes—Machinery	Cost Department Records
Depreciation—Machinery	Cost Department Records
Depreciation—Equipment	Cost Department Records
Taxes—Equipment	Cost Department Records
Engineering Salaries	Chief Engineer
Engineering Supplies	Chief Engineer
Gas	Cost Department Records
Electricity	Cost Department Records
Experimental Labor	Experimental Engineer and Cost Department
Experimental Materials	Experimental Engineer and Cost Department
Shipping Expense	Cost Department Records
Shipping—Miscellaneous	Cost Department Records
Shipping Supplies	Cost Department Records

FIGURE 4—*Schedule of General Factory Expense Accounts*

Budgeting Overhead in a Company Manufacturing to Customers' Specifications

The budget of overhead expense used by the Doehler Die Casting Company of New York is illustrative of the manner by which these expenses can be controlled in a company whose products are manufactured to customers' specifications. It also illustrates the use of standard burden rates adjusted on a sliding scale for varying volumes of production.

The business of this company is greatly affected by periodic fluctuations in each of the principal products manufactured, due to such causes as new models, new inventions, seasonal variations, business depressions and the fact that no two customers use the same products. For these reasons, only the overhead expenses of the various manufacturing departments are budgeted.

The budget is based on the expected production but is adjusted to actual production, and a monthly comparison of actual expenses with the adjusted budget is made up and given to the plant managers with the comments of the General Manager. The basic budget is adjusted through the use of rates of variability which have been assigned to each item of expense.

The amount of adjustment of each item in the budget is found by multiplying the rate of variability by the percentage increase or decrease in actual production above or below the estimated production. The comparison is made at the end of each month and each individual item of expense is compared with the budget allowance of that item after adjustment. The average rate of variability for the two major groups of expense, non-productive labor and supplies, is also calculated for each department, these rates being used by each plant in adjusting their basic budget each week for immediate comparison with and control of actual expense.

An example of this procedure is given in Figure 5 on the following page. The figures given in the illustration are fictitious but they will serve to illustrate the procedure in use. The budget has been set up for a monthly production of 4,000 hours, which was the average production expected during the year. In January, the actual production was 6,000 hours, or an increase of 50 per cent. above the expected production. Therefore, the expenses which increased in direct ratio to production (those marked 100 per cent. variability) are expected to increase 50 per cent. over the original budget. The other items are not expected to increase in direct ratio to production, but only to the extent of the rate of variability shown.

For example, the item of compressor expense shows a variability factor of 20, and it is expected, therefore, that this item of expense will only increase 20 per cent. of 50 per cent. or 10 per cent. The items of depreciation, insurance and taxes, have a zero rate of variability and, therefore, remain fixed regardless of the volume of production.

In February, the example shows that the actual production was 3,000 hours, or 25 per cent. below the expected production. The items with a rate of 100 per cent. variability show a decrease of 25 per cent. from the original budget. However, the item of power, for example, shows a rate of variability of 50 per cent. and it is expected that the power cost will drop only 50 per cent. of 25 per cent. or 12.5 per cent.

The rate of $1.30 per hour is the standard burden rate for the department illustrated and for the year under consideration. The differences between the adjusted budget and the absorbed burden (actual hours multiplied by $1.30) are transferred to a Reserve for Unabsorbed Burden Account, since they represent losses and gains due to actual production being less or greater than the budgeted production. Debits accumulating in this account during months when actual production is less than budgeted are expected to be offset by credits during months when it exceeds the budget. Differences between the actual expenses and the adjusted budget are taken into the operating results for the month, since they are the difference between

DEPARTMENT
FOREMAN

EXPENSE ANALYSIS YEAR

EXPENSE ACCOUNTS	ESTIMATED BASIS	% VARIABILITY	% TO TOTAL	JANUARY	FEBRUARY	MAR	...CEMBER	12 MONTHS TOTAL	MONTHLY AVERAGE
Non.-Prod. Wages									
Foreman	433	-		433	433				
Supervisors	400	80		560	320				
Die Maintenance	1250	100		1875	938				
Equipment Maintenance	417	85		594	328				
Clerk	125	50		156	109				
Dismount & Reset for Repairs	175	100		263	131				
Total Non.Prod. Wages	2800	77.2		3881	2259				
Rate per Hour	70¢			64.7¢	75.3¢				
Supplies									
Die Maintenance Supplies	25	100		38	19				
Equip. " "	325	85		463	256				
Pots	250	100		375	188				
Gooseneck s	400	100		600	300				
Gloves	100	100		150	75				
Nozzles	100	100		150	75				
Total Supplies	1200	95.9		1776	913				
Rate per Hour	30¢			29.6¢	30.4¢				
Shares									
Power	110	50		138	96				
Compressor	490	20		539	466				
Total Shares	600	25.5		677	562				
Rate per Hour	15¢			11.3¢	18.7¢				
Fixed Charges									
Depreciation	534			534	534				
Insurance	11			11	11				
Tax	55			55	55				
Total Fixed Charges	600			600	600				
Rate per Hour	15¢			10¢	20¢				
Grand Total	5200	66.7		6934	4334				
Productive Hours	4000			6000	3000				
Rate per Hour	$1.30			$1.156	$1.444				
Variance in Production				Inc. 50%	Dec. 25%				

FIGURE 5—*Expense Analysis and Budget Comparison*

what the expenses actually were and what they should have been.

The average rate of variability for non-productive wages is 77.2 and for supplies 95.9. By means of these rates the factory accountants calculate weekly the adjusted budget for these two groups of expenses in total only for comparison in their weekly summary of expense. The factory executives also have copies of the original budget showing the rates of variability, so that at any time they may calculate the allowances for any particular item of expense for the production scheduled for the following day or week.

At the end of each month, a detailed report is made up showing how the actual expenses compared with the adjusted budget on each item of expense.

Other Forms of Manufacturing Expense Budgets

Graphic charts showing the relationship between expenses and production volume are used by the Norton Company of Worcester, Massachusetts, in their system of budgetary control. The procedure of this company will be explained more fully in the section devoted to comparison of actual and budgeted accomplishment.

The American Writing Paper Company of Holyoke, Massachusetts, has established burden rates which vary with the volume of production. The various items of burden expense are compared with standards which are termed "bogies." These bogies have been worked out through experience and vary with production, with the exception of

such relatively fixed items as taxes, insurance and depreciation.

The service departments of Eli Lilly & Company such as boiler and engine room, machine shop, laundry and hospital, are budgeted directly and their expense compared monthly with their budget. In preparing budgets for these departments of indirect expense, estimates are made for labor, salaries, supplies, fixed and prorated charges.

METHODS OF CONTROL FOR PLANT AND EQUIPMENT EXPENDITURES

Although the control of capital expenditures for plant and equipment is a function of the general management of an organization, the necessity for these expenditures is largely dependent upon the production program. In planning for the enlargement of production facilities, it is usually necessary to plan for a longer period of time than that included in the budget period.

In deciding to purchase or lease additional plant and equipment facilities, the executives of a manufacturing enterprise will be largely concerned with one question: "Will the probable return on the investment be sufficient to justify the expenditure?" It is necessary to form some estimate as to the volume of production and the probability of profitably using the equipment over a period of years. The volume of business over that period should be sufficient to indicate that the proposed equipment will have a productive use throughout its normal life, and that the savings incurred through the use of the equipment, assuming that it is for replacement purposes, will allow the machine to pay for itself during that time.

Capital expenditures for plant and equipment are usually confined to additions and replacements. Repairs, which include current expenditures on the upkeep of the existing property, are considered as an item of overhead and are controlled through the manufacturing expense budget. The costs of additions and replacements are charged to plant and equipment accounts, and are eventually charged to expense by writing off depreciation based on estimated life.

Several companies reporting their practice, control capital expenditures by having all disbursements for new equipment, replacements or alterations over a fixed nominal amount, usually $100, receive executive approval. Means are provided for adding the depreciation on such additions to fixed assets to the expense budget upon completion of the purchase or lease.

Capital expenditures of The Jeffrey Manufacturing Company of Columbus, Ohio, are controlled in this manner. Expenditures are authorized only upon evidence that the saving in operation costs will be equal to the purchase cost within a period of three years. Expenditures for semi-durable tools are included in the expense budget; expenditures for jigs, fixtures and miscellaneous factory equipment are set up as suspended expense distributed over a three-year period.

Executive approval is required for capital expenditures made by the Canada Dry Ginger Ale, Inc., of New York. Estimates for the necessary additions to plant and equipment are made at the beginning of the budget period and depreciation for these items is added to the departmental burden budgets.

Several companies report plant and equipment budgets developed for the control of capital expenditures. This budget provides an analysis of new equipment needed during the budget period, the cost thereof, when needed, the cost of equipment to be disposed of during the period, the time of disposal, and the estimated revenue from this disposal. The financial executive is thus afforded an estimate of the receipts and disbursements resulting from physical changes in fixed assets during the budget period.

The capital expenditures of the American Sales Book Company, Ltd., of Elmira, New

York, are budgeted in two sections and cover the period of one year:

1. *Plant and Equipment.*
2. *Office Furniture and Fixtures.*

At the beginning of each fiscal year, the Factory Superintendent lists in detail, on the form provided, anticipated plant and equipment expenditures showing the approximate purchase price of each item. This forecast, when passed by the Manufacturing Division Sub-Committee, is referred to the General Manager and later submitted to the Engineering Committee for approval. This forecast, when approved by the Engineering Committee, is forwarded to the Budget Committee for their approval.

Duplicate blank forms provided specially to record proposed purchases of office furniture and fixtures are sent to the various department heads prior to the start of the budget period. Each department head fills in the form, sending the original to the Budget Officer and retaining the duplicate for his records. The Budget Officer summarizes these estimates and submits the summary to the Administrative Division Sub-Committee.

The capital expenditures budget of the B. F. Goodrich Company of Akron, Ohio, is prepared for each fiscal year. This budget is divided into three sections, one being prepared for additions to plant, one for machinery, and one for molds.

COMPARISON OF ACTUAL AND BUDGETED ACCOMPLISHMENT

Budgetary control has been defined as the application of a systematic method of gathering information from the past and present, formulating on this basis plans for the future and, subsequently, reporting to what extent these plans have been carried out. This report, thus far, has been confined to a study of the first phase of budgetary control, the assembling of facts on which to build a plan of operation.

The second phase of budgetary control, the comparison of results of operations with the plan based on the facts assembled, will enable the management to determine how closely the formulated plans are being observed by the operating executives. Variations can be investigated immediately. Investigations will disclose one of two conditions, either the facts used in determining the program of operations were incorrect, or the management has not been operating as efficiently as possible. In either case, variations from the budget will indicate certain difficulties that should be remedied.

Frequency of Review

Comparison of budgeted and actual accomplishment is made periodically by the majority of institutions using budgetary procedure in the control of operations. If a study of the variations between actual and budgeted expenses indicate that the facts used in the preparation of the budget were incorrect, it is the general practice to make revisions in the budget estimates and allowances for the balance of the budget period in accordance with the new facts as presented. The number of times during the budget period that the estimates and schedules are reviewed and revised depends somewhat on the length of the accounting period and the stability of business. The most common practice in those companies using an annual budget is to review the actual performance and make comparisons with the budget at the end of each monthly or four-week period. Several organizations, especially those in non-seasonal industries and whose budgetary experience in the past has been particularly satisfactory, review the budget quarterly.

Method of Comparison

Budget comparison is generally accomplished by arranging for periodical reports on which the actual costs of operation are listed and compared with budget allowances, using the same plan of classification of accounts as on the original estimate forms. These reports

OVERHEAD EXPENSE BUDGET

DEPT. NO. % ADJ. MONTH

Account	Month		Year to Date		
	Adjusted Budget	Actual Expense	Adjusted Budget	Actual Expense	Red—Exp. Over Black—Exp. Under
LABOR					
10 Salaries and Wages—Executive					
11 Salaries and Wages—Clerical					
12 Indirect Labor					
13 Conferences					
14 Attendance Bonus					
15 Overtime Bonus					
REPAIRS					
20 Buildings					
21 Machinery and Equipment					
22 Punches, Dies, Gauges, etc.					
24 Defective or Damaged Product					
25 Scrap Material and Reclaiming					
TOOLS					
27 Moulds					
28 Patterns					
30 Small Tools—Purchased					
32 Punches, Dies, Gauges, etc.					
33 Sample Instruments					
SUPPLIES					
35 Entering into Mfg. Product					
36 General—Not Used in Mfg.					
37 Electrical Sup. and Wiring					
38 Light and Power Purchased					
39 Coal and Water					
41 Stationery, Stamps & Printing					
MISCELLANEOUS					
43 Freight, Express & P. P.					
44 Telephone and Telegraph					
45 Traveling Expense					
46 Interviews					
48-50 Council					
51 Vocational Training					
54 Association Dues					
60 General Expense					
64 Legal and Professional Service					
65 Catalogues and Directions					
69 Journal Advertising					
75 Development Expense					
77 Truck Expense					
78 Test or Tool Rooms					
APPORTIONED					
80 Building Expense					
81 Employees' Welfare					
90 Fixed Charges					
99 Departmental Credits					
TOTAL					
PRODUCTIVE LABOR					

LEEDS & NORTHRUP CO. Form 453

FIGURE 6—*Overhead Expense Schedule and Budget Comparison*

STANDARD AND ACTUAL FACTORY EXPENSE AND VARIATION ANALYSIS

PLANT..... SHEET.....OF..... MONTH OF.....19.....

VARIATION FROM STANDARD MONTHLY ALLOWANCE—BY ITEMS

	CONTROLLABLE EXPENSE ITEMS	
		Misc. Credits
		Inter-Dept. Tran.
		Analy. Labora.
		Packing Exp.
		Memberships & Subscriptions
		Voucher Charges
		Meals Furnished
		Auto and Truck Expense
		Misc. Expense Supplies
		Maintenance and Oiling
		Power, Light, Heat and Air
		Fuel—Gas
		Water—Well
		Water—City
		Clothing
		Raw Material
		Purchases
		Insurance—Compensation
		Payroll
		Expense Jobs
		Repairs Wages and Supplies
		Building Exp. and Repairs
	Uncontrollable	Insurance—Misc.
		Replacement
		Depreciation
		Taxes
		Per Cent. Variation Actual to Standard
		Variation From Standard Amount
		Actual Amounts this Month
		Monthly Budget Standard Amount
DEPARTMENT NO.	DEPARTMENT NAME	

FIGURE 7—*Standard and Actual Factory Expense and Variation Analysis*

Form 82A

Cost Unit.....

Dept..... Month..... Production.....

Stand. Yield on.....% Capacity.....

Actual Yield on.....% Stand. Prod.....

Stand. Yield on.....% Dept. Operation.....%

Actual Yield on.....% Factory Operation.....%

Materials	Standard: Per Unit of Prod.	Standard: Allowance for Total Production	Actual Cost: Quantity Used	Actual Cost: Std. Purch. Price per Lb. or Gal.	Actual Cost: Amount	Variations: Loss	Variations: Gain
Total							
Credits							
Total							
Net							
Direct Expense							
Wages							
Salaries—Prod. Supt.							
Salaries—Chemist							
Power, Light and Heat							
Repairs—Minor							
Repairs—Major							
Maintenance							
Water—City							
Water—Well							
Fuel							
Refrigeration and Ice							
Filters							
Supplies							
Laboratory							
Expense to Finish Operations							
Total							
Indirect Expense							
Building Expense							
Taxes							
Insurance							
Depreciation							
General Office							
Factory Office and Supt.							
Warehouse Expense							
Yard and Misc. Expense							
Purchasing and Traffic Expense							
Expense to Finish Operations							
Total							
Total Production Cost							
Selling, Administrative and Shipping							
Sales							
Packing Expense							
Trucking and Shipping Expense							
Direct Selling Expense							
General Selling and Administration							
Total							
Total Cost							

Total Investment		Department Stock		Unit Cost Variations		
Mach. and Equip.		Standard		Transf'd Material Cost		
Depreciation Reserve		First of Month		Raw Material Cost		
Replacement Reserve		Last of Month		Material Used		
Replacement Charges				By-Products		
Installation Charges		Finished Goods		Direct Expense		
Dismantling Credits		Standard		Indirect Expense		
		First of Month				
		Last of Month		Total		

FIGURE 8—*Monthly Standard Cost Comparison*

usually contain a column for the budget estimates, a column for actual results, and a column for variations between the two, expressed either in dollars and cents, percentages, or both. It is also customary to have a similar comparison for the year to date.

Figure 6 (page 25) illustrates the form used by Leeds and Northrup Company of Philadelphia, for making a monthly comparison between the budget and actual departmental expense. It will be observed that in this particular instance, the budget includes apportioned expense as well as those expenses incurred directly by the department. This form also illustrates the use of factory accounts in preparing the budget.

Figure 7 (page 26) shows the standard and actual expense and variation analysis used by the Monsanto Chemical Works of St. Louis. On this sheet will be found a summary of the departmental comparisons between actual and standard expense. The total actual and standard expense for each department is given together with the total variation and the per cent. variation of actual to standard. Variations between actual and standard for the itemized expenses of each department are shown on this form by a percentage figure. Thus the management have presented to them on one sheet the total variations of each department and the accounts in which these variations occur.

The figures from which this variation analysis is prepared are obtained from Figure 8 (page 27), the monthly standard cost comparison of each product. The operations of the Monsanto Chemical Works are divided by departments, each article being produced in a separate department, although occasionally two products are made simultaneously in one operation. Thus the standard cost comparison for a product becomes the cost comparison for a department. By-products of value in an operation are credited on the cost comparison, and are charged to some other department as raw material if they are so used.

Figure 9, opposite, illustrates the schedules used by The Fairbanks Company of New York for comparing actual and budgeted performance. This form compares the actual expenditures with the budget for all raw material used in the Brass Valve Division. The accumulated actual and budgeted expenses for the year to date are also compared on this form. Figure 10 is used for comparing all the departmental expenses for each department that are controlled by the foreman. The actual and budgeted expenses for the budget period and the year to date are compared by department and in summary form. Figure 11 shows the factory and administrative department expenses controlled by the management. Comparisons are made in the same manner as on the other forms. Figure 12 (page 30) is a summary of the cost of manufacturing. It is, in effect, a summary of the three previous forms and shows the profit or loss for the year to date.

Use of Graphic Charts for Comparison

Graphic charts are sometimes used in conjunction with statistical analysis for comparing actual and budgeted performances. Although the determination of actual results in dollars and cents is more difficult on a graph, variations and trends can be visualized more rapidly with a consequent saving of time.

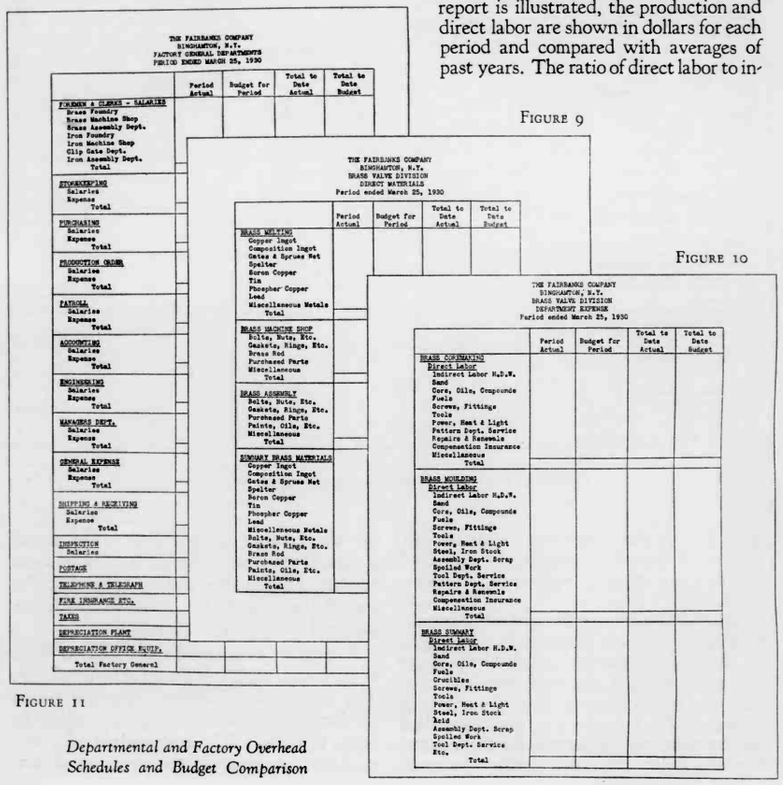
The Norton Company has established for every expense account of every department, including administrative, service and productive, a chart similar to Figure 13 (page 31). For the productive departments the abscissa is the production for that department measured in terms of dollars of list value. The ordinates are the dollars of expense. The curve represents the budgeted allowance for that particular expense item for each dollar of sales. At the beginning of a quarter, the planning department estimates the production for each department in terms of dollars of list value. This is turned over to the budgetary control department which, by finding the corresponding amount on each expense chart for that volume and following up the ordinate to the curve, determines the allowable expense for that item. Additional allowances are made when necessary to assure most efficient operation of that department.

At the end of each quarter the results are plotted on the graph and all variations over the curve must be accounted for. These quarterly results are plotted as points, but are not drawn in as curves. Monthly and quarterly the same results are entered in a ledger in which actual and budget accomplishments are compared. The operating report for the management is made up from the figures shown in this ledger.

Report of Budget Accomplishment

A report of budget accomplishment is submitted to the head of each department in the Norton Company in the form shown in Figures 14 and 15 (pages 32 and 33). These are combined in the form of a booklet and are reviewed by the works manager, the budgetary control department, the methods department, the general foreman, assistant foreman, and the departmental foreman. In the department whose budget report is illustrated, the production and direct labor are shown in dollars for each period and compared with averages of past years. The ratio of direct labor to in-

FIGURE 9


THE FAIRBANKS COMPANY
BINGHAMTON, N.Y.
FACTORY GENERAL DEPARTMENTS
PERIOD ENDED MARCH 29, 1930

	Period Actual	Budget for Period	Total to Date Actual	Total to Date Budget
FOREMEN & CLERKS - SALARIES				
Brass Foundry				
Brass Machine Shop				
Brass Assembly Dept.				
Iron Foundry				
Iron Machine Shop				
Slip Gate Dept.				
Iron Assembly Dept.				
Total				
STOREKEEPING				
Salaries				
Expense				
Total				
PURCHASING				
Salaries				
Expense				
Total				
PRODUCTION ORDER				
Salaries				
Expense				
Total				
PAYROLL				
Salaries				
Expense				
Total				
ACCOUNTING				
Salaries				
Expense				
Total				
ENGINEERING				
Salaries				
Expense				
Total				
MANAGERS DEPT.				
Salaries				
Expense				
Total				
GENERAL EXPENSE				
Salaries				
Expense				
Total				
SHIPPING & RECEIVING				
Salaries				
Expense				
Total				
INSPECTION				
Salaries				
POSTAGE				
TELEPHONE & TELEGRAPH				
FIRE INSURANCE ETC.				
TAXES				
DEPRECIATION PLANT				
DEPRECIATION OFFICE EQUIP.				
Total Factory General				

THE FAIRBANKS COMPANY
BINGHAMTON, N.Y.
BRASS VALVE DIVISION
DIRECT MATERIALS
Period ended March 29, 1930

	Period Actual	Budget for Period	Total to Date Actual	Total to Date Budget
BRASS MELTING				
Copper Ingot				
Composition Ingot				
Gates & Sprues Met				
Spelter				
Scrap Copper				
Tin				
Phospher Copper				
Lead				
Miscellaneous Metals				
Total				
BRASS MACHINE SHOP				
Bolts, Nuts, Etc.				
Gaskets, Rings, Etc.				
Brass Rod				
Purchased Parts				
Miscellaneous				
Total				
BRASS ASSEMBLY				
Bolts, Nuts, Etc.				
Gaskets, Rings, Etc.				
Purchased Parts				
Paints, Oils, Etc.				
Miscellaneous				
Total				
SUMMARY BRASS MATERIALS				
Copper Ingot				
Composition Ingot				
Gates & Sprues Met				
Spelter				
Scrap Copper				
Tin				
Phospher Copper				
Lead				
Miscellaneous Metals				
Bolts, Nuts, Etc.				
Gaskets, Rings, Etc.				
Brass Rod				
Purchased Parts				
Paints, Oils, Etc.				
Miscellaneous				
Total				

FIGURE 10

THE FAIRBANKS COMPANY
BINGHAMTON, N.Y.
BRASS VALVE DIVISION
DEPARTMENT EXPENSE
Period ended March 29, 1930

	Period Actual	Budget for Period	Total to Date Actual	Total to Date Budget
BRASS COMPANING				
Direct Labor				
Indirect Labor H.D.W.				
Sand				
Core, Oils, Compounds				
Fuels				
Screws, Fittings				
Tools				
Power, Heat & Light				
Pattern Dept. Service				
Repairs & Renewals				
Compensation Insurance				
Miscellaneous				
Total				
BRASS MOULDING				
Direct Labor				
Indirect Labor H.D.W.				
Sand				
Core, Oils, Compounds				
Fuels				
Screws, Fittings				
Tools				
Power, Heat & Light				
Steel, Iron Stock				
Assembly Dept. Scrap				
Spoiled Work				
Tool Dept. Service				
Pattern Dept. Service				
Repairs & Renewals				
Compensation Insurance				
Miscellaneous				
Total				
BRASS SUMMARY				
Direct Labor				
Indirect Labor H.D.W.				
Sand				
Core, Oils, Compounds				
Fuels				
Crucibles				
Screws, Fittings				
Tools				
Power, Heat & Light				
Steel, Iron Stock				
Acid				
Assembly Dept. Scrap				
Spoiled Work				
Tool Dept. Service				
Etc.				
Total				

FIGURE 11

Departmental and Factory Overhead Schedules and Budget Comparison

THE FAIRBANKS COMPANY
BINGHAMTON, N.Y.
COST OF MANUFACTURING VALVES
PERIOD ENDED MAR. 25, 1930

COST OF MANUFACTURING	Period ended Jan.28	Cost Per Ton Good Castings	Period ended Feb.25	Cost Per Ton Good Castings	Period ended Mar.25	Cost Per Ton Good Castings	Total to Date	Cost Per Ton Good Castings
Direct Labor								
Direct Materials								
Indirect Labor M & D Workers								
Department Expense								
Iron Division								
Brass Division								
Total Department Expense								
Factory General Expense								
Indirect Labor-Foremen-Clerks								
Fact.Gen'l Salaries-Taxes,Etc.								
Total Factory General								
Total Overhead Budget								
Total Put in Process Budget								
Loss or Gain from Budget								
Direct Labor								
Direct Materials								
Department Expense								
Indirect Labor M & D								
" " F & C								
Factory General								
Inc. or Dec. Production								
Net Loss or Gain from Budget								
Total Actual Overhead								
Total Put in Process Actual								
Net Change, Work in Process								
Net Change, Finished Parts								
Adjustments								
Cost of Valves Mfg.								
Billing Value Valves Mfg.								
Profit on Valves Mfg.								
% Profit								
Net Sales to Branches								
Profit on Sales to "								
(Profit tied up in Inventory)								
% Profit								
Profit tied up in Inventory								

FIGURE 12—*Summary of Cost of Manufacturing*

direct labor is also shown in the same manner. Graphs are shown to each department head for the major items of expense in his department.

On the Department Budget and Expenditure Report which accompanies this graph, all items of expense are recorded. There are two costs worked out on a standard basis from the figures derived from the charts of expenses. The first cost is figured at standard for the estimated production for the quarter, the second for the actual production figure for the quarter at standard. The actual expenses are figured for each of the three periods in the quarter and are totaled at the end of the quarter and compared with the standard cost for actual production.

In a report of this kind there are two kinds of variation which must be accounted for. The first is the difference between actual production and estimated production in terms of dollars. The responsibility for this variation lies between the planning department and the foreman, and can be determined by checking the production orders. The second variation is between the actual costs of actual production and the standard costs of actual production. The responsibility for these expenses belongs to the foreman.

INCENTIVE SYSTEMS FOR SECURING BUDGET ACCOMPLISHMENT

The majority of wage incentive systems for securing budget accomplishment are a part of the general wage incentive plan rather than being set up merely to interest the executives in watching costs. Many executives feel that it is far more profitable to use a method of wage payment that will assist the department heads in developing their managerial ability and help them to become better all-around executives, rather than expense watchers exclusively.

Since all manufacturing costs can be divided roughly into three classes, labor, material, and overhead, it may be well to discuss briefly how incentives may aid in securing budget accomplishment for these three costs.

Wage Incentives

One method for keeping within the budget allowance for direct labor is by the use of a system of wage incentives for employees engaged in the manufacture of the product. When the production schedule has been set, it is a simple matter to determine the labor costs by multiplying the number of operations to be performed by their respective rates. Of course, the cost of breaking in new men and the overtime excess will have to be determined and added to the cost, but the incentive offered will have a strong tendency to keep the labor cost within the budgeted amount.

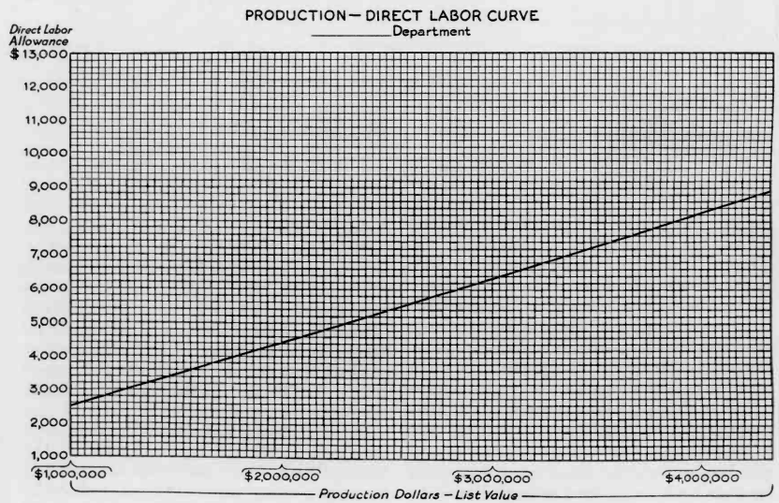
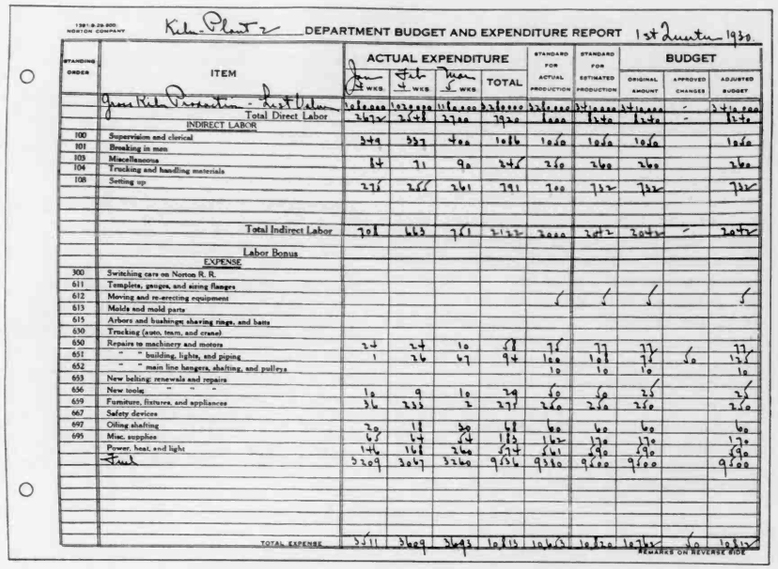


FIGURE 13—*Direct Labor Allowance for Varying Volumes of Production*



Kiln-Plant 2 DEPARTMENT BUDGET AND EXPENDITURE REPORT 1st Quarter 1929

STANDING ORDER	ITEM	ACTUAL EXPENDITURE Jan 4 WKS.	Feb 4 WKS.	Mar 5 WKS.	TOTAL	STANDARD FOR ACTUAL PRODUCTION	STANDARD FOR ESTIMATED PRODUCTION	BUDGET ORIGINAL AMOUNT	BUDGET APPROVED CHANGES	BUDGET ADJUSTED BUDGET
	Gross Kiln Production - Net Value	1060000	1030000	1160000	3250000	3250000	3410000	3410000	-	3410000
	Total Direct Labor	2632	2568	2720	7920	8000	8120	8120	-	8120
	INDIRECT LABOR									
100	Supervision and clerical	349	337	400	1086	1060	1060	1060		1060
101	Breaking in men									
103	Miscellaneous	84	71	90	245	260	260	260		260
104	Trucking and handling materials									
108	Setting up	228	266	261	791	700	732	732		732
	Total Indirect Labor	701	663	751	2122	2020	2052	2052	-	2052
	Labor Bonus									
	EXPENSE									
300	Switching cars on Norton R. R.									
611	Templets, gauges, and sizing flanges									
612	Moving and re-erecting equipment									
613	Molds and mold parts									
615	Arbors and bushings; shaving rings, and batts									
630	Trucking (auto, team, and crane)									
650	Repairs to machinery and motors	24	24	10	58	74	77	77		77
651	" " building, lights, and piping	1	26	67	94	100	108	74	60	134
652	" " main line hangers, shafting, and pulleys					10	10	10		10
655	New belting: renewals and repairs									
656	New tools " " "	10	9	10	29	60	60	33		33
659	Furniture, fixtures, and appliances	36	233	2	271	260	230	260		260
667	Safety devices									
692	Oiling shafting	29	11	39	61	60	60	60		60
695	Misc. supplies	67	64	54	185	162	170	170		170
	Power, heat, and light	146	168	266	574	561	590	590		590
	Scrap	3109	3047	3280	9436	9310	9600	9600		9600
	TOTAL EXPENSE	3511	3629	3893	10613	10636	10720	10782	60	10842

REMARKS ON REVERSE SIDE

FIGURE 14—*Report of Budget Accomplishment—First Page*

Foremen's Bonus

A bonus for foremen is also beneficial in keeping the labor costs within the budget allowance. This is particularly true in those departments where the foreman is allowed to use his discretion as to whether a job should be done on a piece work or day rate basis. It is also helpful in influencing the foreman to keep his necessary indirect labor such as inspection, clerical, supervision, trucking, etc., down to an absolute minimum. Other factors considered by a large metal working plant in paying a foreman's bonus are supervision of labor turnover, attendance, accidents, health and welfare. It is evident that all these factors play a large part in the cost of labor, and the payment of a bonus to a foreman to reduce these expenses will be of assistance in maintaining the labor budget.

Quality Bonus

The control of material costs per unit of finished product is aided by the use of quality and waste material bonuses. Although bonuses of this type, paid to productive employees, are occasionally found in industry, they are more generally restricted to foremen and superintendents. In general, most wage incentive systems stress the production standards, with quality and waste being taken care of by fixing a definite percentage or amount of money by which the production bonus is decreased if the specified quality standards are not maintained.

It is interesting to note in this connection that in a recent survey conducted by the National Industrial Conference Board of 107 plants employing 326,175 workers, only eight plants with 693 participating employees used

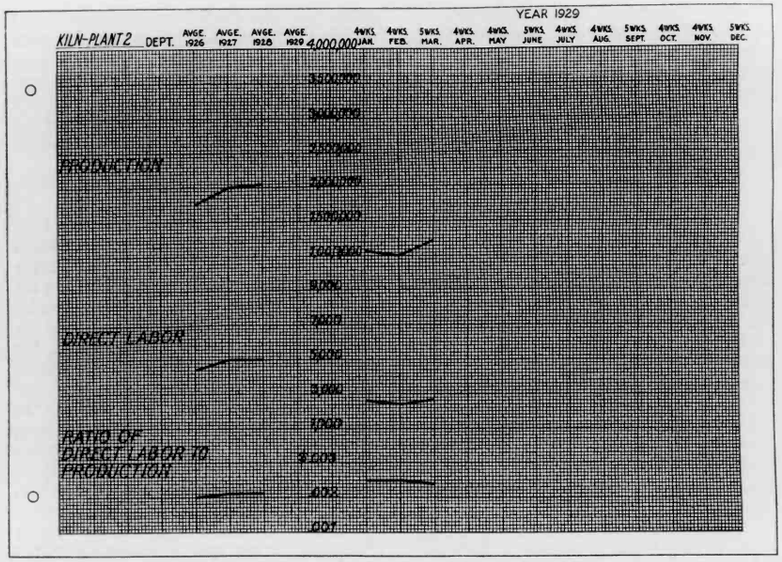


FIGURE 15—*Report of Budget Accomplishment—Second Page*

a bonus for prevention of waste, and only eight plants with 9,589 participating workers used a bonus on improved quality. Although this same survey showed that only four plants out of seventy-seven paid a supplementary bonus to supervisors for improved quality and three for prevention of waste, twenty-seven paid a bonus to their supervisors based on general merit. The greater part of these twenty-seven general merit plans included factors based on maintaining standards of quality and prevention of waste. This general merit bonus, as a rule, is an award for a combination of meritorious achievements, which can be definitely measured, although some companies pay it out of net profits for general accomplishments.

Bonus for Control of Overhead Expense

In the control of overhead expenses a bonus plan can be tied into the plan of budgetary control. Such a bonus plan is usually limited to foremen and executives. In another survey made by the National Industrial Conference Board of 33 companies in which there were 427 executives participating in bonus programs, only one had a definite bonus plan for savings between budgeted and actual expenditures. However, 24 had bonus plans based on general merit which, in some instances, included the accomplishment of the budgetary program.

The Ritter Dental Manufacturing Company of Rochester, New York, has developed a bonus plan in connection with its budget of factory overhead. The budgeting of factory overhead expense is done to give a closer check on this expense and to determine as closely as possible what this expense should be. Overhead is made up of four elements —indirect labor, supplies, scrap, and fixed

charges. Since fixed charges are not controlled by the various department heads, this element was not considered in setting up a bonus. Similarly, the experimental divisions and a few other departments are eliminated from the plan.

The bonus plan of the Ritter Dental Manufacturing Company was inaugurated to secure the best cooperation of foremen and department heads. The bonus is paid to each foreman and department head in a position to control expense and is based on the percentage of saving between the budgeted and actual expense for the plant as a whole. Each foreman receives this percentage of his salary at the end of the year.

INSTALLATION OF THE BUDGET

In installing a system of budgetary control, the usual procedure is to experiment with a department or set of accounts, the expenses of which are readily controllable. The system is further developed then by trial and error until sufficient experience and enough confidence in the principles of budgetary control are attained to warrant extending the budget to other departments or accounts. One of the most common and effective methods is to prepare estimates and allowances for overhead expenses and slowly build on this foundation a complete budget for all operations.

The method of attack used by the American Writing Paper Company is illustrative of the manner by which budgetary control may be instituted. The first step taken by this company was the development of a sales forecast. This was considered the logical step on which to base a necessary reorganization of production methods.

The sales forecast enabled the American Writing Paper Company to make up manufacturing quotas for its various mills. As paper sales fluctuate widely during the year, it became necessary to level the production curve. Ordering points, maximum limits and economical sizes of production orders were worked out for each of the various stock papers, and the issuing of production orders was placed in the hands of the department responsible for the sales forecasts. A perpetual inventory system was set up to assist this department in operating its stock control.

Since the American Writing Paper Company operates several mills, the policy was adopted of allocating the different lines of manufacture to certain mills and equipment. This enabled the company to establish standard specifications of manufacture for each of its products. These specifications set up the percentage of the various materials that enter the composition of the paper. By applying the standard specifications to the manufacturing quotas, material quotas were developed for all of the materials used by the production departments. This enabled the company to reduce the amount of working capital tied up in raw material inventories and avoided accumulating raw materials for lines of products which had become obsolete.

After the manufacturing quotas had been established, a standard payroll for regular operation was set up and operated from the Employment Department through authorization cards. There is one authorization card for each position. As long as someone is on the payroll covering that authorization, no additional employment is made without a change in the standard payroll or a temporary authorization signed by the proper authority.

The next step was the installation of a group bonus system in all the mills by which a standard number of man-hours is set up for each of the groups of employees. Actual time is measured against standard to determine the efficiency. For each efficiency rating there is a table of corresponding bonuses to be added to the employees daily wage. Overhead standards were worked out from past experience and, with the exception of such relatively fixed items as taxes, insurance, and depreciation, these standards vary with production.

The result of the foregoing has been the installation of a standard cost system embodying the usual three items of material,

labor and burden. The standard specifications cost becomes the standard material cost. The standard payroll and the resulting figures for production rates, together with standards set for the bonus system, give the standard labor cost. Standard overhead costs are secured by prorating the budgets for overhead items.

Another method of approach is illustrated in the following statement by J. R. Tobey, Assistant Treasurer of Eaton, Crane and Pike Company, Pittsfield, Mass.:

> Our first attempt at budgeting was done before very much was heard about the budget, at which time we used to budget our advertising appropriation. This went on for several years until every one became interested in budgeting and at that time we started with indirect labor, and then departmental supplies and indirect material, and each year we picked up a few expenses until we gradually had all of the expenses involving the manufacturing cost of goods sold. After we completed these, we took the selling expenses and the administrative expenses, etc., until we had accumulated and collected in our budget every item of expense that went into our profit and loss statement.
>
> It takes several years to build up a budget so that it is working well. It is not an easy thing to install a budget in a plant or an office. There is always a great reaction from the people, particularly foremen and executives, who will say that it is impossible to prepare a budget for this expense or that expense, but any one who has had much experience in budgeting will soon find that there is always a way, either by trends, curves or percentages of some kind, that will give a basis from which to prepare a budget.
>
> It takes some time to prepare a budget and have it operate successfully, and we have had to build this up over a period of many years, educating our people so that they think in the terms of budget, until we feel that we have a powerful control of our expense.

PRESENTATION OF THE BUDGET

An important factor in developing a budget program is the attitude of the organization's personnel. The introduction of control through the budget requires education of the executive personnel to the advantages to be derived. In long established organizations it is common to find that responsibilities have been loosely and indiscriminately delegated with limits of authority not clearly defined. Since budgetary control takes for granted clearly defined responsibility, this situation must be clarified before the budget can be applied successfully. An organization study is usually helpful.

THE BUDGET MANUAL

A manual of budget procedure is a helpful guide, both in the introduction and maintenance of the budget. It is a place of reference on procedure and defines the duties and authority of each individual and committee as members of the budgetary organization.

The *Manual of Budget Procedure* prepared and used by the American Sales Book Company, Ltd., consists of twenty-four typewritten pages on which various phases of budgetary control are covered. The budget organization and the functions of the personnel in budget operation are set forth. The *Manual* outlines the procedure for the preparation of the capital expenditures budget, the purchasing budget, the sales estimates, the sales expense budget, the administrative expense budget, the production schedule, and the production budget, giving in each instance the items to be taken care of and the function responsible for each, thus providing a definite guide to budget operation.

VALUE OF THE BUDGET

The chief value of any system of budgetary control lies in the results that are or can be obtained through its use. Also, many executives are firmly convinced that the budget is one of the most useful implements for establishing executive control. A statement of results obtained in several industries by the use of a budget system may not be out of place in concluding this report.

A. J. Paget, Auditor of the Fairbanks Company, reports that in the first three months of 1930 the manufacturing costs exceeded the budget allowance by only 2.18 per cent. This is considered a very satisfactory showing when the unsettled business conditions of this period are considered.

A company manufacturing building equipment produced to customers' specifications, has been able to forecast its sales over a period of ten years with an accuracy of 84 per cent. For the last two years they have been able to obtain 95 per cent. accuracy.

A. J. P. Estlin, Assistant Treasurer, Canada Dry Ginger Ale, Incorporated, states that his company has found that with their cost accounting methods it has been possible to estimate production costs with a variation of considerably less than one-tenth of one per cent.

Eli Lilly & Company have been establishing sales quotas for the past six years. During that period their actual sales have varied from the estimates within one or two per cent. each year.

The Andrews Steel Company, Newport, Kentucky, have employed a plant and maintenance budget for several years with considerable success. The Controller of this company, H. B. Boal, states that through the use of this budget the firm has succeeded in reducing labor, material and overhead costs from seven to twelve per cent. below the budget allowance by improving the operating efficiency of their departments.

The final objective of the control system used by the American Writing Paper Company has been to assure profits. L. S. Reynolds, Controller of this company, states:

> Although we have not yet reached 100 per cent. efficiency with this system, it functions more perfectly each succeeding year.

Referring to the practical operation and value of a budget system, H. I. Smeltzer, Treasurer of Robbins and Meyers, Inc., Springfield, Ohio, closes his letter with the following paragraph:

> If the management recognizes the benefit of budgets and backs them up to the limit, all organizations with a good accounting and cost system should have no difficulty in working out a satisfactory budget procedure. The benefits from such a program are so well recognized that further comment seems unnecessary.

ACKNOWLEDGMENT

THE POLICYHOLDERS SERVICE BUREAU gratefully acknowledges the generous cooperation of the following companies in the preparation of this report. It also wishes to express its appreciation to the other companies who furnished helpful information, but who preferred to have their names withheld, due to the nature of their operations. Similarity of practices among several companies precluded the insertion of all the illustrations of budgetary control methods contributed by the cooperating companies.

A

ALLIED BARREL CORPORATION.....Oil City, Pa.
AMERICAN AGRICULTURAL CHEMICAL CO., THE.....New York, N. Y.
AMERICAN BOSCH MAGNETO CORPORATION.....Springfield, Mass.
AMERICAN BRASS COMPANY, THE..Waterbury, Conn.
AMERICAN ROLLING MILL COMPANY, THE.....Middletown, Ohio
AMERICAN SALES BOOK COMPANY, LTD..Elmira, N. Y.
AMERICAN STEEL FOUNDRIES.....Chicago, Ill.
AMERICAN WRITING PAPER COMPANY, INC.....Holyoke, Mass.
ANDREWS STEEL COMPANY, THE.....Newport, Ky.
ARMSTRONG CORK COMPANY.....Lancaster, Pa.
ATLANTIC REFINING COMPANY, THE .Philadelphia, Pa.

B

BABCOCK & WILCOX COMPANY, THE.New York, N. Y.
BIGELOW-SANFORD CARPET COMPANY, INC.....Thompsonville, Conn.
BUFFALO FOUNDRY AND MACHINE COMPANY.....Buffalo, N. Y.

C

CAMPBELL, WYANT & CANNON FOUNDRY COMPANY.....Muskegon, Mich.
CANADA DRY GINGER ALE, INC.....New York, N. Y.
CARBORUNDUM COMPANY, THE ..Niagara Falls, N. Y.
CHAMBERSBURG ENGINEERING COMPANY.....Chambersburg, Pa.
CHENEY BROTHERS.....South Manchester, Conn.
CHRYSLER CORPORATION .....Detroit, Mich.
CLEVELAND-CLIFFS IRON COMPANY, THE.....Cleveland, Ohio
COLGATE-PALMOLIVE-PEET COMPANY.....Chicago, Ill.
C. G. CONN, LTD.....Elkhart, Ind.

D

DAYTON STEEL FOUNDRY COMPANY, THE.Dayton, Ohio
DEERE & COMPANY.....Moline, Ill.
HENRY DISSTON & SONS, INC.....Philadelphia, Pa.
DOEHLER DIE CASTING COMPANY...New York, N. Y.

E

EATON, CRANE & PIKE COMPANY....Pittsfield, Mass.
ECLIPSE AVIATION CORPORATION..East Orange, N. J.
THOMAS A. EDISON, INC.....Orange, N. J.
ERIE CITY IRON WORKS.....Erie, Pa.

F

FAIRBANKS COMPANY, THE .....New York, N. Y.
FIBREBOARD PRODUCTS, INC.....San Francisco, Calif.
FIRESTONE TIRE & RUBBER COMPANY, THE.....Akron, Ohio
FOSTER WHEELER CORPORATION....New York, N. Y.
FULLER BRUSH COMPANY, THE.....Hartford, Conn.

G

THE B. F. GOODRICH COMPANY.....Akron, Ohio

H

HAZEL-ATLAS GLASS COMPANY....Wheeling, W. Va.
HINDE & DAUCH PAPER COMPANY, THE.....Sandusky, Ohio

I

INDUSTRIAL BROWNHOIST CORPORATION.....Cleveland, Ohio

J

JEFFREY MANUFACTURING COMPANY, THE.....Columbus, Ohio
JOHNSON & JOHNSON .....New Brunswick, N. J.

K

KALAMAZOO VEGETABLE PARCHMENT COMPANY.....Kalamazoo, Mich.
KELLEY-SPRINGFIELD TIRE COMPANY.New York, N. Y.

L

LEEDS & NORTHRUP COMPANY.....Philadelphia, Pa.
LEVER BROTHERS COMPANY.....Cambridge, Mass.
LIBBY, MCNEILL & LIBBY.....Chicago, Ill.
W. S. LIBBEY COMPANY.....Lewiston, Me.
ELI LILLY & COMPANY.....Indianapolis, Ind.
LONG BELL LUMBER COMPANY, THE.Longview, Wash.
LOWE BROTHERS COMPANY, THE.....Dayton, Ohio
LYCOMING MANUFACTURING COMPANY.....Williamsport, Pa.

M

MACBETH-EVANS GLASS COMPANY.....Charleroi, Pa.
MINNEAPOLIS-MOLINE POWER IMPLEMENT COMPANY.....Minneapolis, Minn.
MONROE CALCULATING MACHINE COMPANY, INC.....Orange, N. J.
MONSANTO CHEMICAL WORKS.....St. Louis, Mo.
MURPHY VARNISH COMPANY.....Newark, N. J.

N

NATIONAL ACME COMPANY, THE....Cleveland, Ohio
NATIONAL ENAMELING AND STAMPING COMPANY, INC.....Milwaukee, Wis.
NEWPORT NEWS SHIPBUILDING & DRY DOCK COMPANY.....Newport News, Va.
NORTH AMERICAN CEMENT CORPORATION.....Albany, N. Y.
NORTON COMPANY.....Worcester, Mass.

O

OTIS ELEVATOR COMPANY.....New York, N. Y.

P

PACIFIC MILLS.....Boston, Mass.
PENNSYLVANIA SALT MANUFACTURING COMPANY.....Philadelphia, Pa.
PURINA MILLS.....St. Louis, Mo.

R

REED-PRENTICE CORPORATION.....Worcester, Mass.
RITTER DENTAL MANUFACTURING COMPANY, INC.....Rochester, N. Y.
ROBBINS & MYERS, INC.....Springfield, Ohio
ROWNTREE COMPANY, LTD., THE.....Toronto, Can.

S

SHEPARD NILES CRANE & HOIST CORPORATION.....Montour Falls, N. Y.
SIVYER STEEL CASTING COMPANY....Milwaukee, Wis.
SQUARE D COMPANY.....Detroit, Mich.
STANDARD BRANDS, INC.....New York, N. Y.
STANLEY WORKS, THE.....New Britain, Conn.
SULLIVAN MACHINERY COMPANY.....Chicago, Ill.
SUN OIL COMPANY.....Philadelphia, Pa.

T

TAYLOR-WHARTON IRON & STEEL COMPANY.....High Bridge, N. J

W

WALWORTH COMPANY.....Boston, Mass.
WESTERN ELECTRIC COMPANY.....New York, N. Y.
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.....East Pittsburgh, Pa.

METROPOLITAN LIFE INSURANCE COMPANY PRESS
NEW YORK, U.S.A.—J-30
(n)1266 L. G.

COLUMBIA UNIVERSITY
This book is due on the date indicated below, or at the expiration of a definite period after the date of borrowing, as provided by the rules of the Library or by special arrangement with the Librarian in charge.

DATE BORROWED	DATE DUE	DATE BORROWED	DATE DUE
~~DEC 20 1948~~			
11-6			
JAN 15 1949			
	1-3		
DEC 2 1 1948	5/14		
MAY 10 1949	5/24		
DEC 19 1949	1/7		
18May'51	6/1		
Apr20'53			
~~DEC 28 '59~~			

C28 (638) M50

COLUMBIA UNIVERSITY
0032055897

D432.8 M5653
Metropolitan life insurance co.
Budgeting manufacturing operations.
C.G. Thompson
MAR 8 1940 448 R'side
5/6 1945 Reg. Mr. 258 7th Ave Bklyn
MAY 10 5/24
DEC 19 1944 W. Model 340 W 72 st
Y1
2/20/50 Res. Villers G.S.I.E.262
18May'51 N. K. Shalla 500 Riverside Dr
6/6 M. Venuck
Apr20'53 1508 88

M5653
MSH00360
NEH
FEB 25 1994

JUL 24 1939

END OF
TITLE